



MINISTRY OF HEALTH OF BRAZIL

**National Policy on  
Science, Technology  
and Innovation in  
Health - Brazil**



Ministry  
of Health  
of Brazil

Brasília - DF  
2006

MINISTRY OF HEALTH OF BRAZIL  
Secretariat of Science, Technology and Strategic Inputs  
Department of Science and Technology

# **National Policy on Science, Technology and Innovation in Health - Brazil**

B Series, Basic Texts in Health Field

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2006

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The National Policy on Science, Technology and Innovation in Health (Política Nacional de Ciência, Tecnologia e Inovação em Saúde – PNECTIS), enacted in July 2004, during the 2<sup>nd</sup> National Conference on Science, Technology and Innovation in health (2<sup>a</sup> Conferência Nacional de Ciência, Tecnologia e Inovação em Saúde - CNCTIS), resulted from a collective work that involved, in all of its stages, about 15 thousand participants among delegates, guests and observers in the fields of education, science and technology.

From April to July 2004, the debates promoted by the organizing and executive commissions, in partnership with the National Health Council, have disclosed the achievements during this long way, which started ten years ago, during the 1<sup>st</sup> National Conference on Science and Technology in Health. There were held 331 conferences on Science, Technology and Innovation in Health, of which 24 were at State level and 307 at regional and municipal levels. Only the states of Roraima, Tocantins and Goiás have not promoted conferences. After the discussions, the States prepared their contributions to the PNECTIS, resulting in the National Consolidated Report.

The 644 participants of the 2<sup>nd</sup> CNCTIS, among which 431 were delegates with right to voice and vote, representing the fields of Health, Education, Science and Technology. The Health sector was represented by 299 delegates, where 149 (50%) were users, 68 (23%) were managers or health service providers and 82 (27%) health workers. The users' category was composed of representatives of community-based associations (24%), patients' associations (19%), national, state and municipal health council (35%), trade unions (5%) and others (17%). Health workers were members of professional associations (27%), state and municipal health secretariats (17%), national, state and municipal health councils (12%), trade unions (18%) and others (26%).

The Science and Technology sector rested on the participation of 62 delegates, of whom 34% represented managers and scientific associations, 11% were from research institutions, 6% from universities and 15% belonged to other categories. The Education component was represented by 70 delegates. It is worth mentioning that, of that total, 55% represented universities, while 13% represented research institutions and 6% were managers.

The Conference provided a political forum of discussions that allowed for aligning the objectives of the National Health Policy and those of the National Policy on Science, Technology and Innovation in Health,



translating the articulation between health, education, science and technology sectors and the traditional power of users, workers, service providers and managers.

Among the topics approached in the Conference, the leading principles and axes that have oriented the construction of this document stood out. They are as follows: respect to people's life and dignity; commitment towards ethical standards in the research-related activities; improved health to the Brazilian population; search for equity in health; social inclusion and control; and, respect to the methodological plurality.

We expect to provide the Brazilian society with a technical-political referential to guide their demands and evaluate the governmental action. The conclusion of this work assists in endowing the science, technology and innovation in health's actors with the required tools to "produce and apply knowledge in the pursuit of universalization and equity, providing high-quality health care to the population".

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## 1 Introduction

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1. The National Policy on Science, Technology and Innovation in Health (*Política Nacional de Ciência, Tecnologia e Inovação em Saúde - PNCTIS*) is an integral part of the National Policy on Health (*Política Nacional de Saúde - PNS*), formulated in the Brazilian Unified Health System (*Sistema Único de Saúde - SUS*). The Federal Constitution, in its Article 200, clause V, establishes SUS' competences and, among them, includes enhancing scientific and technological development within the SUS scope.
2. SUS follows three main constitutional principles: universality, integrality and equity. All mentioned principles are also applicable to the PNCTIS. In the light of science and technology, such principles should be enforced following the political and ethical commitment towards the production and appropriation of knowledge and technologies capable of contributing to reduce social inequity in health, in tune with social control.
3. The scientific and technological knowledge production reports other characteristics than those of health service and actions production. For that reason, the organizational principles that rule SUS – municipalization, regionalization and hierarchization – sometimes cannot be mechanically adopted when outlining the science, technology and innovation in health - STI/H although such rules should be considered whenever possible.
4. The PNCTIS is also a component of the National Policy on Science, Technology and Innovation (*Política Nacional de Ciência, Tecnologia e Inovação - PNCTI*) and, thus, is subject to the same principles that rule it, namely: technical-scientific merit and social relevance.
5. The main objective of PNCTIS, as well as of the PNCTI, is to contribute to the sustainable national development and support the technical and scientific knowledge production, meeting the economic, social, cultural and political needs of the country.
6. For the purposes of this document, the guiding principle when establishing the Health Research scope was its objective, i.e., Health Research comprises the knowledge, technologies and innovations that may lead to improvements to population's health.
7. A significant share of data survey on scientific and technological development in Brazil adopts the rule of considering Health Research only as the sum of clinical, biomedical and public health research activities. That traditional concept of Health Research, based on knowledge areas rather than on sectors of application, leaves aside researches developed in areas related to applied social human

sciences, mathematic and earth science, agrarian sciences and engineering. Moreover, that view includes researches comprising knowledge areas such as biological sciences, which, sometimes are not directly related to human health.

8. The major objectives of the PNCTIS, which is focused on the population's health needs, are the development and optimization of knowledge production and appropriation processes by health systems, services and institutions, human resources training centers, productive sector corporations and other civil society segments. Thus, the PNCTIS should also be considered a component of industrial, educational, and other social policies (12<sup>th</sup> National Conference on Health, 2003).
9. The PNCTIS also approaches the use of scientific and technological research as an important subsidy to outline regulatory and operational tools at the three governmental spheres. For its legal competences, the three governmental spheres are in charge of producing laws and rules that, supported on knowledge, allow for the broad and proper promotion, protection and recovery of the citizen's health.
10. In order to have an effective PNCTIS, the government sector, as well as civil society, should participate in the elaboration and implementation phases. That is true if we consider health as a society right that should be preserved and developed, and that the State should provide the required means for achieving such purpose.

## 2 The Current Situation of Science and Technology in Brazil

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### 2.1 Science and Technology Historical Development in Brazil

11. Since the early 1950's, and particularly in the following three decades, Brazil, in comparison to other countries of recent industrialization, built an expressive research park. In many aspects, it was built following the stage of imports replacement of the industrialization model. By that time, some of the basic characteristics of research and development – horizontality and little selectiveness – were bound to the then prevailing model in scientific production, which was mainly oriented to create a critical mass of qualified human resources. The technological component immaturity is mostly due to the industrialization model, which failed in fostering development and capacity-building in sciences, technology and innovation.
12. However, the prevalence of a developmental national model brought about the necessity of articulating technical scientific production and the agricultural and industrial production. Some examples of that articulation to technological development are provided by the establishment of the Brazilian Agriculture Research Corporation (*Empresa Brasileira de Pesquisa Agropecuária - Embrapa*) and the departments of Research and Development (R&D) of state-owned corporations, like Petrobrás, additionally to the articulation with the Technological Institute of the Brazilian Aeronautics (*Instituto Tecnológico da Aeronáutica - ITA*) and the Brazilian Aeronautics Corporation (Embraer). In the field of development mechanisms, it is worth recalling the Fund for Technology of the Brazilian Bank of Economic Development (*Banco Nacional de Desenvolvimento Econômico - Funtec/BNDE*) and Brazilian Agency of Financing to Studies and Projects (*Financiadora de Estudos e Projetos - Finep*) that exists up to these days. However, that model was almost inexistent in the field of social policies, except for some few exceptions like the Program on National Self-Sufficiency in Immunobiological Products (*Programa de Auto-Suficiência Nacional em Imunobiológicos - Pasni*).
13. The organization of the scientific and technological park, besides being more directly bound to economic policy, is influenced by the prevailing scientific and technological development concept in each stage. Until recently, the prevailing concept assumed that innovation process would be a natural consequence of the incessant knowledge

accumulation, which starts with basic research, and, necessarily, by the end of the linear path of successive increments, results in the production of technological innovation. Now this linear conception has been challenged.

14. Similarly, the idea of the strict border and structural tension between "basic research" and "applied research" has been object of intensive debate and criticism. The PNCTIS must consider all types of research, from basic to the operational one.
15. That policy should also rest on a broader view about the scientific and technological knowledge applied to health, and the respect to methodological plurality, allowing for the employment of different research visions, including those of qualitative and quantitative nature.
16. Since the 1980's, the articulation has been strengthened among countries that share the same idea, according to which Health Research is an important tool to the improve population's health situation, as well as to the decision-making process in policy definition and health planning. That has contributed to improve actions on promotion, protection, recovery and rehabilitation in health and to reduce social inequity. International Organizations in the Health field, notably the World Health Organization (WHO), have been playing an important role in this movement, where Brazil should try to increase its participation.
17. Despite holding a position of little significance in the international scenario of scientific production, Brazil achieved some tradition, characterized by the capacity of: a) internally generating most of the financial resources used for running the installed research capacities; b) qualifying almost all human resources in research, from technicians to Doctor's degree holders, in its territory. These two facts clearly differentiate Brazil in the existing Health Research Scenario in most of the developing countries.
18. In Brazil, as in other countries, the Health sector also represents the bigger component of all scientific and technological production. Concerning its territorial distribution, scientific production in health is more concentrated in the Southeast region. In what regards researchers, health researchers' qualification is similar to that of researchers in other areas, where most of them hold a Doctor's degree. Of the 10,938 doctors that work in several knowledge areas related to the sector, 53.8 % belong to the large Health field.
19. According to data provided by the National Council for Scientific and Technological Development (*Conselho Nacional de Desenvolvimento Científico e Tecnológico - CNPq*), the groups developing researches in health report an appreciable volume of production, mainly of academic-bibliographic nature. For every ten works published, one

regards research of technical nature that resulted in some kind of registration. Nevertheless, the support to protect activities dealing with intellectual property and patent registration remains inadequate. The poor tradition of fomenting ST&I actions, short capacity of transferring knowledge generated in higher education institutions to the industry and services sectors, and the lack of clear policies and adequate tools to induce knowledge transferring are other aspects related to the prevalence of bibliographical production.

20. The ST&I activities are relatively concentrated at university institutions and some research institutions with specific missions. The development of those activities in health services, SUS management and private firms of the productive sector is incipient, despite the existing efforts to enhance them.

## 2.2 Human Resource Qualification in Science, Technology and Innovation in Health

21. Among the most promising facts occurred in the scenery of human resources qualification to research in Brazil in the last decade, are outstanding both the implementation of the Technological and Scientific Initiation Program (Programa Institucional de Bolsas de Iniciação Científica - Pibic) and the geographic decentralization of the Post-Graduation - *stricto sensu* - programs. That decentralization, if followed by a sustainable flow of resources to the North, North-east and Middle-east regions, as foreseen in the sectoral funds operation of the Ministry of Science and Technology, can contribute to correct one of the serious distortions in human resources distribution in research, which is the intensive geographical concentration.
22. The Health Research sector, in general, does not differ from other sectors in what concerns human resources distribution, yet this sector presents some components that are more concentrated than the average, such as medical and dental research in São Paulo, and others less concentrated, such as collective health, where the presence of the Northeast region is higher than the average rate of participation of that region in all knowledge areas.
23. Furthermore, there are important shortages in technological development in Brazil, mainly in the North, Northeast and Middle-East regions, mainly those related to the lack of excellence centers, professionals and institutions qualified to manage the innovation process, compliant to the quality and security requirements of the regulatory authorities.
24. Despite some initiatives to keep Doctors in universities, the 90's

experienced an intensive curtailment of job posts, which remained vacant in universities and research institutes. On one hand, that hindered the reposition of qualified staff, and on the other hand, led to the emergence of a teaching population, the so-called substitute professors, with little or no qualification and available work hours to the research, besides holding weak labor links with the institution. Currently, the Ministry of Education is trying to meet the needs of federal universities allowing for public contests.

25. It is believed that the number of scholarship granted by development agencies to the qualification and institutional settlement of new researchers is insufficient, particularly to Master's degree students. If the tendency towards reducing the number of scholarships persists, it can entail a negative impact on the young researchers supply. It is worth mentioning the lack of specialized professionals in important areas, such as clinical, evaluation, environmental, toxicological, ergonomic, chemical and pharmaceutical technologies research, projects management and intellectual property.
26. Concerning scientific and professional qualification of SUS workers, there are only few opportunities of capacity-building to formulate the system's demands of ST&I/H, based on the needs and problems faced in the system, health services and use of scientific and technological production to improve health programs and actions.
27. At the same time, there are gaps in what concerns dissemination and diffusion of scientific and technological information relevant to SUS management. Despite many successful initiatives, such as those of the Ministry of Education and the Ministry of Science and Technology database and of the Virtual Health Library of the Latin-America and the Caribbean Center of Information in Health Science (*Centro Latino-Americano e do Caribe de Informação em Ciências da Saúde - Bireme*) of the Pan-American Health Organization (PAHO), the country still misses new accessible and clear communication forms to lay population and health professionals. This aspect hinders social participation and socialization of science and technology production towards equity, and, therefore, implies short use of the knowledge produced.

### 2.3 Productive Complex in Health

28. The Productive Complex in Health is composed by three main components: chemical, pharmaceutical and biotechnological industry; mechanics, electronics and material industry; and services providers. In the last years, the two first segments presented significant commercial deficit, reaching approximately US\$ 3.5 billions, in 2001.

From those deficits in the commercial balance, 70 % results from relations with developed countries and 30 % from relations with countries that report development levels similar to the Brazilian.

29. Many factors account for the national limitations in the pharmaceutical industry. First, it results from the unbalance among R&D competencies in the pharmaceutical productive chain, since the areas of Pharmacology, Pharmacodynamics and Basic Research rest on competencies comparable to those of developed countries, while in the areas of Clinical Pharmacology, Pharmacokinetics, Chemistry and pharmaceutical technology the existing competencies are below the developed countries' levels. Another factor would be the diffuse orientation of investments with little or none selectiveness. The incipient management of intellectual property and disarticulation between SUS and the innovation system, additionally to the lack of clear policies and adequate mechanisms of induction in the transfer of scientific knowledge to the productive sector is another important impairing factor. The pharmaceutical industries that produce phytotherapeutic products find a special difficulty in R&D due to the lack of qualified human resources to research the effectiveness and security of the Brazilian medicinal plants, as well as to elaborate appropriate methodologies to review the quality of those products.
30. Vaccine production requires intensive scientific and technological grounds, has high fixed production cost, long productive cycle, producers' concentration, steady expansion of products options range, strong regulatory requirements and its main purchaser is the public sector. The Brazilian vaccine market is one of the biggest worldwide, and national producers are all public. Although Brazil already produces a significant share of the required vaccines to domestic consumption, the commercial balance is also negative in this item, evidencing the need for investments in R&D to guarantee autonomy and self-sufficiency in this sector.
31. One can hardly quantify the efforts of ST&I/H in Brazil. The data for R&D activities in enterprises are very precarious, containing little information about the Health field. It is estimate that in Brazil, in 2000, about US\$ 13 billions were committed to R&D, mostly granted by the Government and applied in activities developed by higher education institutions. The low rate of investments by the private sector is ascribed to the strong internationalized character of the Productive Complex in Health, which led the enterprises installed in the Brazil to choose for developing the R&D activity at their headquarters abroad.
32. Moreover, it is worth mentioning that although science and technology in health represent a strategic segment to achieving supremacy in Brazil, the lack of an industrial policy, additionally to



- an economic and financial environment unfavorable to risky private investments in R&D and scarce public resources, have hampered the private sector to develop R&D activities at the expected level.
33. Here, some additional determinants are: expensive and long-lasting process of patent or copyright registration and the reduced social value of intellectual property, favored by the high price of patented products and low population income. The system of patenting processes and products in Brazil was modified by Law # 9279/96, which added new sectors as fine chemistry, pharmaceutical and biotechnological products. When the Law was enacted, the government omitted the enforcement of some prerogatives set forth in the TRIPS Agreement to developing countries, which allowed time extension to new sectors. The extended time would permit a transition period to adjust the use of science and technology and the development of processes and products, mainly aimed at promoting cultural changes and integrate the private initiative, government organizations, higher education institutions and research institutes to the new legal framework, thus guaranteeing the required means to the wide socialization of results.
  34. Its worth noticing that the uncontrolled commercial openness observed in the 1990's in Brazil has worsened the panorama of R&D investments in the productive health complex. Due to the failure in advocating for strategic industrial sectors, the period experienced a decaying in the productive capacity for some fundamental inputs, such as pharmaceutical chemicals. In the 1980's, the Brazilian industry accounted for about 15 % of the national demand of pharmaceutical chemicals. Currently, the corresponding total does not even reach 3 %. A similar phenomenon was also noticed in other products such as, for instance, antibiotics and various types of equipment used in the health care and research.
  35. Especially for the pharmaceutical sector, the investments in R&D in Brazil by the private sector industries account for 0.32 % of the earnings. The resources are typically used to finance clinical studies, more as marketing strategy than to develop or transfer technology. There are only few patents registered in the country (Competitiveness Forum of the Pharmaceutical Production Chain). According to data provided by the Global Forum of Health Research, the pharmaceutical industry allots about 10 to 20 % of its earnings to R&D in the developing countries.
  36. Concerning the State regulatory role, the current standards of intervention are far below the needs and possibilities pointed out by the research and development installed capacity. Sometimes, innovations are inadequately assessed in relation to efficacy, effectiveness and costs, whether prior, during or after programming

and their incorporation to services. That usually generates media-induced demands, damages to health and inefficiency in the use of financial resources in the health system.

## 2.4 Health Research Development

37. Although being very significant, the governmental effort towards developing Health Research remains insufficient. In the Federal scope, stands out the work developed by the Ministry of Science and Technology through its development agencies, and the work of the Ministry of Health, through its institutions and projects contracted with research groups in several centers countrywide. Still, it is worth mentioning the work of the Ministry of Education, particularly in human resources qualification and scientific information dissemination, through Coordination for Higher Graduates Improvement (*Fundação de Coordenação de Aperfeiçoamento de Pessoal de Nível Superior - Capes*), and in the maintenance of university hospitals of federal universities. In the State scope, the research institutes and science, technology and innovation centers play remarkable roles and are bound to health secretariats, university hospitals and to some development agencies, particularly the Foundation of Support to Research (*Fundação de Amparo à Pesquisa - Fapesp*) of the State of São Paulo which, from the last decade on, has been developing supporting programs to the strategic Health Research, with relevant national and international impact.
38. The 1<sup>st</sup> National Conference of Science and Technology in Health recommended the creation of a Secretariat of Science and Technology within the scope of the Ministry of Health. The proposal was implemented only in 2003. The establishment of the Secretariat of Science, Technology and Strategic inputs in Health (*Secretaria de Ciência, Tecnologia e Insumos Estratégicos em Saúde - SCTIE*) incorporated the Department of Science and Technology (*Departamento de Ciência e Tecnologia - Decit*), created in 2000, and added two new departments: the Department of Health Economics (*Departamento de Economia da Saúde - DES*) and the Department of Pharmaceutical and Strategic Inputs Care (*Departamento de Assistência Farmacêutica e Insumos Estratégicos - DAF*). The Ministry of Health participates with about 20 % of the total public disbursement in Health Research, while the Ministry of Agriculture, through Embrapa, participates with almost twice the double (39%). These data show the need of assigning a new role to the Minister of Health, in the heart of Health Research development structure. For that, it would be necessary to raise its capacity of inducing R&D in health, getting it closer to health policy needs.

39. Concerning costs in actions of ST&I/H, there is no consolidated information, especially due to the weak sectoral database approaching enterprises' expenses. Concerning academic research, the existing estimates do not provide an accurate panorama. Health is the research field that is granted more resources all over the world. It is estimated that, in 1998, US\$ 73.5 billions were invested, of which only US\$ 2.5 billions corresponded to investments in R&D by the developing countries, including Brazil (Global Forum of Health Research, 2001). At the same time, the impact caused by the financing in R&D on the population's health remains poorly known.
40. In what concerns research infrastructure, a common obstacle has been the scarcity of resources to be invested. Additionally to the lack of R&D facilities in core areas, it's important to detach the precarious situation of education units and hospitals. The difficulties in affording care actions, additionally to incipient mechanisms of institutional research management associated to education capable of inducing scientific production in the various knowledge areas, and the lack of resources to investments, hamper ST&I actions in those services. Then, the hard conditions of most of those services contribute in increasing the discrepancy between time and speed of production of new diagnosis, prognostics and therapeutic procedures to benefit population at large.
41. An analysis on the development-oriented actions carried out by governmental bodies discloses:
  - a) Quality, competitiveness and transparency in development-oriented actions, particularly those developed by the Ministry of Science and Technology agencies and Capes, as well as by most of the state agencies. Such characteristics are ensued by the Brazilian experience with development practices on relatively competitive grounds;
  - b) Low inducement capacity to set research priorities, mainly in the Ministry of Science and Technology agencies, Capes and some State agencies, in what regards researches to be developed by financing agencies;
  - c) Presence of an important research tradition at federal and state institutes specifically devoted to health, despite the critical situation that some of them are now facing;
  - d) Development model with multiple sources of financing that has historically served as a protection tool to research executors;
  - e) Lack of adequate coordination mechanisms among the different development spheres at state level and, particularly, between the two federal players, namely, the Ministry of Science and Technology and the Ministry of Health;
  - f) Incipient articulation between ST&I development-oriented actions and health policy. Among other consequences, it contributes to the

- poor capacity of transferring new knowledge to health industries, systems and services, and to civil society in general;
- g) Extensive and generalized need for R&D activities developed at productive private sector's corporations;
  - h) Development-oriented actions carried out by the Ministry of Health are inductive and characterized by constant link to health priorities, but competitiveness and visibility mechanisms are incipient in the financing to research projects;
  - i) Lack of social control mechanisms to legitimate actions, assess results and inspect resources committed.
42. Such characteristics point out the starting point to the PNCTIS in what concerns management of R&D activities with social control. Furthermore, they disclose the existence of an utmost relevant institutional asset regarding execution and development, and point out the major impairments – coordination difficulties, low articulation and precarious governmental regulation – to the integral use of its capacities.
43. One of the main objectives of the PNCTIS is to overcome coordination-related difficulties, extracting the best of both traditions – the Ministry of Health's capacity of inducement and the Ministry of Science and Technology's capacity of mobilizing the scientific community. That is an important aspect in the complementarity and search for synergy among actions.



### 3 Principles of the National Policy on Science, Technology and Innovation in Health

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44. The PNCTIS should be guided by the “ethical and social commitment towards improving - in the short, medium and long run - the Brazilian population’s health conditions, taking regional differences into consideration and pursuing equity” (1<sup>st</sup> National Conference on Science and Technology in Health, 1994). Here, the basic principles would be: respect to people’s lives and dignity; improvement of the Brazilian population’s health; search for equity in health; social inclusion and control; respect to philosophical and methodological plurality.
45. The commitment towards overcoming all forms of inequity and discrimination (regional, social, ethnical, gender and others) is one of the PNCTIS basic principles and should guide all its aspects, all its choices and priorities.
46. The respect to people’s lives and dignity is the PNCTIS basic ethical principle. It should attach utmost attention to the ethical issue in Health Research, and all achievements in the scope of the National Commission of Ethics in Research (*Comissão Nacional de Ética em Pesquisa - Conep*) of the National Health Council, jointly with the Institutional Committees of Ethics in Research (*Comitês Institucionais de Ética em Pesquisa - CEPs*) should be put on the record.
47. The PNCTIS is primarily committed towards ensuring the development and implementation of high ethical standards in Health Research. For that, it should establish mechanisms to ensure the countrywide compliance with such ethical standards by public and private, national and international corporations, in the light of security and dignity of the research subjects, pursuant to the Resolution 196/96 by the National Health Council and complementary rules. Furthermore, it is expected to foment the assembling and strengthening of local committees of ethics in research, and improve the system of ethical review and approval of researches involving human beings. The responsibility for any damage to the health of involved individuals is to be demanded, as well as the strengthening of social control in the committees of ethics in research (12<sup>th</sup> National Conference on Health).
48. The plurality principle refers to opening the PNCTIS to all philosophical and methodological approaches capable of advancing knowledge and solving pertinent scientific and technological problems. Similarly, it implies appraising different areas of knowledge in health, respecting their definitions of validity and methodological rigidity.

49. In what concerns the principle of social inclusion and control, the PNCTIS should comprise the citizen's inclusion in knowledge society through means of scientific, technological and cultural education responsive to the current reality and future challenges, respecting and appraising local knowledge and cultures. Furthermore, it should contribute to improve the citizen's quality of life and respect environment, thus guaranteeing the future of generations to come.

## 4 Guiding Axes to the National Policy on Science, Technology and Innovation in Health

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50. In order to have the PNCTIS in tune with its principles, it should be guided by: (1) extensiveness – capacity of intervening on several points of the knowledge chain; (2) inclusiveness – insertion of the producers, financiers and users of technical-scientific production; (3) selectiveness – inducement capacity; (4) complementarity between the inducement and spontaneity logics; (5) competitiveness – way of selecting technical and scientific projects; (6) merit in what regards the projects' quality; (7) social, sanitary and economic relevance – usefulness of knowledge produced; (8) managerial responsibility with governmental ruling; (9) presence of social control.
51. *Extensiveness* comprises any research aimed at advancing knowledge, whether for immediate application or not. Therefore, it includes – additionally to knowledge production – researches oriented to technological development and innovation; technological evaluation; clinical research; researches on standards of use and cost/benefit analysis to several kinds of technology in health, among others. The different views on the health-disease process from different cultural systems of health care, such as the medicine of Indigenous peoples, *quilombolas*, riparian communities, Eastern medicine and others may be contemplated, respecting and preserving the ethnic-cultural diversity. These categories are applicable to all scientific fields related to health.
52. *Inclusiveness* refers to the participation of institutions and actors involved in ST&I/H actions. The PNCTIS should induce, support and promote the production developed by higher education institutions, productive sector enterprises, non-governmental organizations and public and private partnerships, open to social control. Besides taking into consideration the producers of technical-scientific knowledge, the PNCTIS shall include the institutions involved with financing, distribution and use of technical-scientific information, i.e., the public managers of scientific research and health policies, managers of other public policies, entrepreneurs in the productive sector and representatives of organized civil society in charge of social control.
53. *Selectiveness* concerns the need for increasing the inducement capacity of the scientific and technological development system. That is to say it should try to adjust the development based on a selection of priorities, in a process capable of allowing for broad participation



- of researchers, users, health professionals and other actors, according to the National Health Policy.
54. *Complementarity* approaches the need for sustaining Health Research as the exercise of complementary logics, gathering research inducement capacity and fulfillment of spontaneous demand. Therefore, it could preserve the creativeness inherent to scientific activity, while meeting the country's needs of research and development, ensuring benefits to population at large.
  55. *Competitiveness* should be the navigation chart to develop actions within the PNCTIS scope. The competitiveness among different projects should be the basic requirement to ensure transparency to the financing criteria, rationality when setting agenda priorities within the PNCTIS scope.
  56. *Scientific, technological and ethical merits* are core requirements to ensure high quality to R&D actions in civil society-financed ST&I/H and should be assessed following criteria and indicators defined in a transparent way.
  57. *Social and economic relevance* in the sense of advancing or applying the results to solve priority health problems should be the main target of scientific and technological activities.
  58. *Managerial responsibility* concerns the transparency and respect to rules that govern the use of public revenues, setting forth rigid penalties and reimbursement of eventual losses caused to the population.
  59. *Social control* should actively participate, at the level of local, district, municipal, state and national councils, in the monitoring of public resources allotment and use in Health Research.

## 5 Strategies of the National Policy on Science, Technology and Innovation in Health

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60. The main PUNCTIS strategies are:
- a) Sustaining and strengthening the national effort in science, technology and innovation in health;
  - b) Creating the national system of innovation in health;
  - c) Constructing the national agenda on priority researches in health;
  - d) Creating mechanisms to overcome regional inequities;
  - e) Improving the State's regulatory capacity and creating the national network of technological evaluation;
  - f) Disseminating scientific and technological advances;
  - g) Qualification, capacity-building and absorption of human resources in the national system of science, technology and innovation in health, fostering the scientific and technological production all over the country, taking into consideration regional cultural characteristics and affairs;
  - h) Participation in and strengthening of social control.
61. The development and implementation of high ethical standards in research, as the guiding principle to practices in this field, intertwines all the aforementioned strategies. In that sense, the 2<sup>nd</sup> CNCTIS highlights the importance of assembling and strengthening local ethics committees, pursuant to the principles set forth in the Resolution # 196/96 by the National Health Council, to provide security and dignity to the subjects involved. Moreover, it suggests improving the system of ethical review and approval, notably for researches involving human beings and polemical aspects, such as gender, race and ethnics.

### 5.1 The Maintenance and Strengthening of the National Effort in Science, Technology and Innovation in Health

62. This strategy, as a condition to the sustainable development and welfare, demands political awareness and mobilization, vision of future and constructing the national capacity in science, technology and innovation, to respond to and anticipate the Brazilian needs. Cross-sectorality, national and international cooperation, as well as technological transfer, guided by the values of solidarity among peoples and respect to national sovereignty, are important components of that mobilization effort.

63. The main actions of this strategy are:
- a) Articulation with institutions in charge of fostering new researchers and supporting scientific initiation at all education levels, as well as on the permanent health education poles, respecting regional needs and establishing participation channels for new researchers;
  - b) Establishment of awards to foster scientific and technological development in health;
  - c) Creation, expansion, diversification and continuous granting of financing sources to actions of R&D in health;
  - d) Development of the capacity of managing and performing ST&I actions at the three SUS political-administrative spheres;
  - e) Strengthening partnerships among public institutions to foster Health Research;
  - f) Induce the creation or support to centers of science, technology and innovation in health at health secretariats, articulated to higher education and research institutions;
  - g) Spurring the assemblage of municipal and state councils of science, technology and innovation;
  - h) Motivation to the participation of health sector workers in scientific and technological researches;
  - i) Continuous investments to improve the infrastructure of research and technological development in health, attaching special attention to teaching hospitals and hospitals participating in SUS networks, research institutes, federal centers of technological education, health councils, higher education institutions and health services of public nature;
  - j) Efforts to establish partnerships and researches networks in the Latin American, African and Asian countries, to face shared health conditions;
  - k) Promotion and accomplishment of the National Conference on Science, Technology and Innovation in Health at every four years.
64. Furthermore, it should foster inter-institutional articulation among the more developed and less developed centers, and induce horizontal technical cooperation among countries. At national level, the inter-institutional articulation should include the assembling of networks among different STI/H institutions to elaborate research programs and projects, placing priority on regional necessities, without overlapping or doubling actions or researches, and ensuring the applicability of their results.

## 5.2 Creation of the National System on Innovation in Health

65. Creating this system is important to strengthen national autonomy and overcome the technological delay. It demands the mobilization

- of all the installed capacity of research, education, initiatives on technological development and innovation in health, in a specific and cross-sectoral methodological perspective, including inter-institutional cooperation networks. The health councils and remainder spheres of social control and ST&I/H management, at the three government spheres, should foster and promote debates on technology-related demands in that field, to improve health services and guarantee access to new technologies.
66. The cross-sectoral articulation is required to integrate scientific and technological production and the public and private productive sector, thus attaching priority to and preserving the public interest. Among the required actions, are outstanding the implementation of cooperation projects and the creation of regional technological parks, taking into consideration the different local realities.
  67. Another crucial issue is the consolidation of the role played by the Ministry of Health, health secretariats, health councils and other similar spheres in the implementation of development policies oriented to the productive complex in health, integrating and strengthening research and technology centers, official laboratories, higher, medium and vocational education institutions, with emphasis on research and the production of medicines, products, processes and equipment to health care. Through that, it aims at reducing the Brazilian dependency in what regards technological and productive field, besides ensuring self-sufficiency in strategic items to the Country.
  68. Due to its remarkable dynamism, degree of innovation and social interest, Health sector is a privileged field to elaborate and implement industrial and innovation policies, articulated to health policy. The niches with high potential of success are vaccine production, immunobiological products and new diagnostic technologies.
  69. Other relevant areas to health include the research and development of new products to the treatment, prevention and promotion, such as phytotherapeutic products, pharmaceutical products and medicines, blood derivatives, homeopathic medicines, and inputs to other complementary practices of health promotion and prevention, insecticides and bio-insecticides, techniques of food enrichment, equipment and other inputs. Finally, it would be necessary to take into consideration the development and production of inputs required to the practice of research, such as high quality disposable plastic products to be used in laboratories, from tubes to micro-centrifuges and ultra-centrifuges to high quality globes. It is also worth mentioning the potential entailed by nanotechnology applied to health.
  70. The State shall play an outstanding role in the promotion and regulation of the productive complex in health, through convergent

actions to support competitiveness, financing and incentive to R&D in public enterprises; procurement policies; intellectual property advocacy; incentive to partnerships and investments in infrastructure. The policy of incentive to innovation should be guided by selectiveness; higher degree of reliability regarding partnerships with industries; and expanded interaction among health services, education and research institutions and the productive complex. It is of utmost relevance employing the State's and its companies' purchase power to preserve jobs and reach competitiveness in the national production of pharmaceutical products and medicines, while practicing social control.

71. The Ministry of Health should follow-up the actions and initiatives in R&D related to public health policies, even when developed by sectors external to the National Health System.
72. The main tools of the innovation policy are:
  - a) Strengthening the mechanisms to foster sectoral funds oriented to R&D;
  - b) Qualification and capacity-building of human resources to activities in R&D;
  - c) Appraisal of traditional knowledge and strengthening of its potential towards generating innovations;
  - d) Incubation programs to new national corporations;
  - e) New projects with public institutions, foundations and community-based institutions;
  - f) Fiscal incentives, such as fiscal credit and special tax deductions for national corporations investing in R&D;
  - g) Incentives to implement productive and research arrangements, duly ruled and followed-up;
  - h) Creation of mechanisms to defend, protect and optimize the flow of recognition of innovations developed in Brazil;
  - i) Creation of favorable environment to generate and strengthen technology-based corporations working in the sector;
  - j) Strengthening the use of intellectual property and technology transfer mechanisms;
  - k) Strengthening social control in the innovation policy.
73. To the pharmaceutical industry sector, the proposed short-run strategies are:
  - a) Definition and support to the development of target medicines strategically relevant in social and economic areas, so as to foster national production, with emphasis on pharmaceutical chemicals;
  - b) Record of national competencies and availability in R&D;
  - c) Creation of a scholarship program to scientific and technological development;

- d) Strengthening the capacity of developing clinical trials to evaluate the efficacy, security and efficiency in the use of new pharmaceutical, allopathic, homeopathic, phytotherapeutic products and byproducts of the Brazilian fauna and flora, appraising the Brazilian biodiversity;
- e) Definition of poles of production and industrialization of phytotherapeutic products;
- f) Creation of managerial mechanisms capable of articulating different actors in the pharmaceutical productive chain;
- g) Definition of a national policy on phytotherapeutic and homeopathic medicines;
- h) Implementation of the National Information Network on Medicinal Plants (Rede Nacional de Informação de Plantas Medicinais - Reniplan), coordinated by an inter-ministerial commission.

In the medium-run:

- a) Identification of potentially successful technological niches;
- b) Establishment of lines of credit to investment in R&D;
- c) Incentive to the development of technical cooperation networks.

In the long-run:

- a) Research and production of new molecules;
  - b) Research of new systems to release pharmaceutical products.
74. It is necessary to set priority to the investment in development and production of medicines (pharmaceutical chemistry), in other inputs to provide care to diseases and in other priority health issues, privileging the national production, if necessary, through "compulsory licensing" with emphasis on public and private institutions developing RD&I in Brazil, using, protecting and appraising the Brazilian biodiversity and providing subsidies to the production and distribution of essential and generic medicines. It shall also foster the research of medicines and inputs to meet the demands of complementary practices of promotion, prevention and protection to health, such as homeopathy, acupuncture and phytotherapy.
75. To the sector of production of vaccines and immunobiological products, the proposed strategies are as follows:
- a) Creation of the national program on competitiveness in vaccines and immunobiological products, aiming not only the production of known vaccines, but also the development of new vaccines;
  - b) Elaboration and implementation of a policy of exports to the national production surplus;
  - c) Incentive to the creation of national bio-technology companies;
  - d) Spur to investments in R&D in Brazil by the national and international producers of vaccines and immunobiological products;

- e) Fostering to efficient mechanisms of technology transfer to technologically advanced vaccines.
76. The core steps towards accomplishing those strategies are:
- a) Partnership with public laboratories producers of vaccines, defining specialization niches among them;
  - b) Organizational managerial renewal and modernization of the legal-institutional structure of such laboratories;
  - c) Capacity-building to strategic personnel;
  - d) National and international certification of industries, according to the required bio-security principles;
  - e) Support to the national industry of the productive complex in health, including financing to R&D projects;
  - f) Guarantee of purchase and other incentives;
  - g) Strengthening the capacity of developing clinical trials (Brazilian platform for clinical trials), the productive and regulatory capacities of the State, and the protection to intellectual property.
77. In the sector of equipment and expendable materials it is necessary to:
- a) Foster the research and development of equipment to Health sector with national patent, emphasizing the studies on equipment and technologies to SUS and to the laboratories producers of medicine; on electronic equipment; on software; and, mixed components (electronic/biological);
  - b) Reduce tax burden on the production of equipment and health inputs, electronic components, software and mixed components (electronic/biological);
  - c) Assemble regional technological parks to R&D and qualify professionals to handle health equipment, electronic components, software and mixed components (electronic/biological);
  - d) Develop equipment, products and inputs and other auxiliary means to guarantee access to individuals with special needs.
78. Still concerning the national innovation system, it would be necessary expanding the partnerships with other nations to review the international agreement on the patent of inputs, equipment and medicines. The review should guarantee that technological advances favorable to life be considered as public property and interest, additionally to the principle according to which the right to life and health should prevail over any commercial agreement. Similarly, is recommended a review on the Patents Law, aiming at protecting national interests, taking into consideration priority health problems. Legislation should simplify the compulsory licensing process; incorporate the parallel import contemplating the prerogatives set forth in the WTO Trips Agreement; and, also, prohibit the award and extension of patents to new usages or new formulations. It should

also strengthen the prior consent to patent of health inputs, to be exercised by the Ministry of Health through means of the Brazilian Authority on Sanitary Surveillance (*Agência Nacional de Vigilância Sanitária – Anvisa*). Moreover, it should intensify the control on bio-piracy.

79. It is important to approach the fostering to legal protection of researches' results, through mechanisms of intellectual property, including those of technological processes resulting from traditional knowledge and products extracted from the Brazilian fauna and flora by public institutions or companies of national capital. Furthermore, the information on patents in health should be organized and made available in specific broad and accessible databases.
80. Promote the technological development and innovation in health services, contributing to the elaboration of indicators that allow for monitoring and evaluating the innovations, having in mind the global efforts towards reforming health services in the light of overcoming the existing inequities in terms of access and use of such services.
81. Expand international partnerships within the scope of health systems and services, aiming at interchanging innovative experiences oriented to strengthen the principles of solidarity and to achieve broader equity in health systems and services.

### 5.3 Constructing the National Agenda of Priorities in Health Research

82. The constructing of the National Agenda on Priority Researches in Health is a technical and political process involving the set of social actors committed to the PNCTIS – managers, health professionals, service providers, users, development agencies, qualification bodies, researchers, productive sector and the organized civil society. It should take into consideration the national, regional, state and local health necessities. Furthermore, it should be capable of increasing the selective inducement of production of knowledge and material and procedural goods in priority areas, aiming at the development of social policies. Different segments are expected to follow-up the agenda elaboration and implementation.
83. The agenda is a process in permanent construction and, in its elaboration and implementation, it should contemplate the participation of local organized civil society, in articulation with health councils and other actors, expanding to the state and national levels.
84. The agenda constructing should be oriented to prospecting efforts, in the sense of anticipating the needs for new knowledge in a world that is in quick and permanent change. Thus, the agenda, although based on the population's health needs shall not be identical to



them. On one hand, the fulfillment of health needs sometimes does not depend on Health Research and, on the other hand, sometimes the knowledge field and scientific and technological practices miss concepts, methods or tools adequate to meet the necessities through means of research.

85. The agenda should be based on efficient scientific and technological knowledge. The technical ground should incorporate knowledge, technologies, tools and evidences concerning the conditioning elements or determinants to the changes on life quality, besides taking into consideration the required sustainable development. For that, it demands accessible, updated, valid and reliable technical-scientific information and health systems. It should also be streamlined to the PNCTIS guiding principles and axes, be committed to SUS principles and approach regional specificities.
86. Four broad groups of priority health issues are identifiable in any country or region: 1) the ones that can be faced by means of a combination of interventions available and the expanded coverage to the population using health services; 2) problems that can be faced by improving the efficiency of interventions available; 3) the ones that can be faced by improving the cost-effectiveness of interventions available; and, 4) those which cannot be faced employing the interventions available. To cope with the last three groups of problems it would be necessary to rest on the contribution of scientific and technological researches of different natures. Therefore, the agenda of priorities is expected to comprise from basic to operational research relevant to health, and should be endowed with a comprehensive and pluralist scope of theoretical-conceptual and methodological approaches.
87. It should incorporate researches in all scientific areas, in order to produce new knowledge and practices oriented to health care, taking into consideration cultural and ethnical aspects and fostering integrated studies of multi-professional, interdisciplinary and cross-sectoral nature.
88. Besides serving as a navigation chart to development-oriented actions within SUS scope, the National Agenda of Priority Researches in Health should act as a guideline to other agencies of scientific and technological development working in the Health field, and should be one of the criteria to approve projects, due to the relevance of those agencies in meeting the population's health needs and to solve the health system's problems.
89. The Ministry of Health should head the process of constructing the National Agenda of Priority Researches in Health, because of its strategic role in organizing the national effort on Health Research, guaranteeing the contribution of all social segments and political

and institutional actors involved in SUS consolidation and in the Brazilian Health Sector reform.

90. Moreover, it is recommended the constructing of municipal agendas on Priority Researches in Health for municipalities reporting significant scientific production. The constructing process should contemplate the following aspects:
  - a) Creation of a systematic discussion forum among workers, users, managers and researchers, defining the ST&I/H agenda oriented to the population's needs and following SUS principles and guidelines. Therefore, it would be capable of providing capacity-building to let the involved actors perceive the agenda as a guiding tool to public investment, besides providing transparency and disseminating the government actions in that field.
  - b) The National Policy on Science and Technology should support the municipal and state secretariats in the establishment of ST&I/H structures in their scope, understanding it as an important activity to manage the system.
  - c) Priority research lines in the municipality, to respond to the health system's necessities: health-disease process; health system and services and the work process. They also approach organization tools and mechanisms to implant and implement the ST&I/H implementation and organization within SUS in a decentralized and balanced way.

## 5.4 Overcoming Regional Inequities

91. The articulation among actions developed by the Federal Government, states and municipalities plays a crucial role in reducing inequities. The initiatives towards establishing centers and networks on research, the elaboration of demands to the ST&I/H system and implementation of programs to induce scientific knowledge production, under development by the Ministries of Health and Science and Technology jointly with state foundations of support to research in partnership with health secretariats, are examples of important mobilizing programs that should be strengthened.
92. At the federal sphere, through initiatives developed by the Ministries of Education, Science and Technology and Health, it should define a policy to reduce regional inequities, fomenting research and post-graduation, fixing research groups and the establishment of Doctor's Degree holders centers with different percentages for the North, Northeast, and Middle-West regions, favoring the scientific and technological competence.
93. Among the strategies to be implemented the following are

outstanding:

- a) Respect to regional vocations in the fostering to research and post-graduation, as well as when preparing the Calls for Bid that associate research infrastructure strengthening and human resources qualification;
  - b) The need for having the Ministries of Health, National Integration, Education and Science and Technology executing, in an articulated way, a policy to reduce regional inequities in ST&I/H;
  - c) Approach regional thematic issues and needs; epidemiological, ethnical data and data on social development to define priority researches to be developed, so as to provide guidance to development agencies, research and education institutions, productive sector and health secretariats;
  - d) Foster the establishment of research groups and establishment of Doctor's Degree holders' centers;
  - e) Foster the creation and strengthening of Master's and Doctor's courses in health at the North, Northeast and Middle-West regions;
  - f) Enhance partnerships and consortia with advanced research centers, suggesting them to promote regional integration through researches developed therein.
94. In what concerns financial resources to reduce regional inequities, the recommended strategies are as follows:
- a) Review the parameters and establish criteria to increase and allot financial resources in ST&I/H, considering regional characteristics and cultural affairs, mainly in the Northeast, North and Middle-West regions;
  - b) Foster the creation and strengthen the work of research supporting foundations in states;
  - c) Set priority investments in ST&I/H for the investment plans at the three spheres, based on organized information on the potential and degree of development of scientific and technological programs in the regions;
  - d) Ensure the allotment of resources to public health schools, universities and other research institutions with vocation for on-job research, fostering scientific and technological production in the North, Northeast and Middle-West regions.
  - e) Ensure resources allotment to the South and Southeast regions, mainly to states where scientific production remains incipient, aiming at reducing inequities in the region;
  - f) The resources to be allotted to the North, Northeast and Middle-West regions should be mostly granted by new financing sources and should not imply reduced resources to the South and Southeast regions;
  - g) Foster the establishment of cooperation networks;

- h) Expand the application of resources in Calls related to the Amazonian multi-lateral agreement on ST&I/H.

## 5.5 Regulatory Capacity Improvement

- 95. In order to guarantee the regulatory capacity improvement, it would be necessary to establish networks with the participation of executive and legislative regulatory bodies, scientific investigation and technological development centers, teaching hospitals and other public care institutions and organizations devoted to social control. Those networks should effectively participate in the elaboration and implementation of mechanisms to evaluate and incorporate new technologies, inputs and products to the market. The strategy aims at expanding the capacity of producing knowledge in order to qualify the decision-making process within the scope of public management. Therefore, it can fulfill one of the major needs of our contemporaneous society, i.e., to have crucial technical and scientific information to support the decision-making process which, in turn, has strong impact on different scientific areas and contributes to establish a new stage to the links among science, state and civil society.
- 96. The following actions are suggested to improve the state regulatory capacity:
  - a) Structuring a policy to evaluate health technologies based on sound scientific evidences, involving the three governmental spheres, to subsidize the decision-making process concerning the critical and independent incorporation of products and processes. The policy should involve researchers, managers, service providers, health users and professionals, and define cross-sector mechanisms to evaluate the efficacy, security and efficiency of the use of new processes and products. The mechanisms defined should also allow for the economic evaluation pursuing the best cost/effectiveness relationship.
  - b) Within the health system scope, employ the assessment exercise to rule and govern the need for developing, purchasing and incorporating technologies and equipment to facilitate the work performance and increase the managers', workers' and users' reliability on the results of health actions and services, pursuant to the criteria set forth in Laws 8080/90 and 8142/90. Based on the identified necessities, prepare a plan to incorporate technologies and regional researches to evaluate the social and environmental impact on health ensued by their use, largely disseminating the results to population in general.
  - c) Incorporate – after judicious evaluation and studies on the

technological validation at health units belonging to the public network – new technologies to improve, implement and update the health system, seeking for quality, better equity in terms of region, gender, race/ethnics, care to individuals with special needs and sexual orientation, guaranteeing access and broad social control.

- d) Define, evaluate, incorporate and use the bio-technological advances in health, with emphasis on the analysis, monitoring and management of bio-security, taking into consideration the implications and repercussions in the field of bio-ethics and ethics in research. It should establish policies to create mechanisms, at the three governmental spheres, to repress bio-piracy.
- e) Create judicious mechanisms and criteria to rule the use of genetically modified organisms, medicines, chemicals and agriculture chemicals; medicines; researches development; and, evaluation of environmental impacts and their consequences to health. Those mechanisms and criteria should be clearly informed to civil society, through broad debate with the participation of the three governmental spheres, corporations dealing with research and technology development, scientific community and the organized civil society.
- f) Contemplate the regulation of researches involving cloning techniques and the use of stem cells, emphasizing the limits and their use towards improving the collective health.

## 5.6 Scientific and Technological Advance Diffusion

- 97. The PNCIT/S should comprise a policy on communications in health, aimed at supporting and expanding initiatives favorable to the scientific dissemination for researchers, entrepreneurs, managers, health professionals, students at different levels, stages and modalities of the Brazilian education system, attaching emphasis to courses in the field of health, and to civil society. It aims at guaranteeing broad social appropriation of benefits entailed by science, technology and innovation in health. That policy should be backed with financial resources to ensure the required autonomy, independence and sustainability.
- 98. Concerning the strategies to democratize ST&I/H information, it is recommended to:
  - a) Create local mechanisms to socialize new scientific and technological knowledge oriented to health workers and to the organized civil society, aimed at promoting citizenship, such as access to technical and scientific library in municipalities; activities developed by the public education network at health units and community centers; forums, seminars, science fairs, including theme conferences and

- workshops; museums, science centers and science and culture integration centers; and, access to information material on the theme;
- b) Foster the creation of libraries in the health secretariats, with access to scientific journals, technical-scientific documents, endowed with infrastructure of computers and Internet access, open to society and adequate to activities related to studies, research and innovation in health. The consultation to virtual databases and libraries should be spurred by providing clarification and support to users;
  - c) Foment the implementation of forums of debate to disseminate the results of researches involving risks to health related to exposure, irradiation and production of medicines, food — including the transgenic ones—, cosmetics, materials for human consumption, insecticides and agriculture chemicals that may cause damages to health;
  - d) Guarantee room in communications means through the publication of reports, journals, articles, manuals and other means to publicize information relevant to SUS management, in a clear and accessible language to population, besides publishing in proper means to individuals with special needs;
  - e) Broadly disseminate the resources for investment in projects on research and capacity-building, results achieved and others, through the permanent education in health poles, foundations of support to research and other entities;
  - f) Establish a program on population's digital inclusion, to disseminate knowledge and foster welfare;
  - g) Further the establishment of innovative hearings and participation mechanisms (observatories, popular consultations or consensus-building conferences) to effectively integrate citizens to the process of formulation and implementation of policies on science, technology and innovation;
  - h) Create centers and forums to advertise and popularize science and technology in health;
  - i) Define the active participation of the Health sector in the Week of Popularization of Science and Technology in Brazil, enacted by the Government of President Lula.
99. In what concerns strategies oriented to technical-scientific information in health, the recommendations are:
- a) Promote regular scientific meetings with health and education managers and workers at federal, state and municipal levels and of the councils, to interchange experiences and improve managerial practices in ST&I/H;
  - b) Structure an automated on-line system, managed by the Ministry of

Health, to publicize researches in health, with databases, ways of access and search, debate forum on the use of results and technological advances entailed, emphasizing the partnership among state and municipality, public higher education institutions and community councils;

- c) Ensure that scientific journals and books issued in Portuguese and foreign languages are distributed to public universities' libraries in quantity compatible to the number of students and activities of education and research, guaranteeing the renewal of their respective collections.
100. Expand the channels to publicize the calls for bidding dealing with the development and results of national researches, through written press, electronic means and television, broadcasting, universities and health services, aiming at reaching civil society and enforcing social control. The dissemination should obey ethical criteria and, regardless if they were publicized through traditional means of scientific dissemination, they should be provided in a language suitable for individuals with special needs.
  101. Guarantee support to scientific journals published in Portuguese in Brazil, and recommend the development agencies to attach special attention towards fostering the expansion and regularity in the publication of national journals and articles on public health policies, capable of translating and summarizing the scientific knowledge, thus making it accessible to professionals and strengthening health practices. It should, moreover, foster the dissemination of scientific production through means of journals of international circulation.
  102. Select evaluation indicators and ways to disseminate the scientific production, appraising national publications and other ways of disseminating the researches results, trying to favor the publicizing of scientific information to the civil society.

## 5.7 Human Resources Qualification and Capacity-building

103. The expansion of human resources qualification and capacity-building through *lato sensu* and *stricto sensu* post-graduation courses is an essential strategy to enhance the existing research groups; improve the institutions' regulatory capacity; implement the evaluation of technologies in health; develop the production and use of scientific and technological knowledge in health programs, actions and services; improve ST&I/H management and other demands resulting from the policy and oriented to respond to sanitary problems faced by the Brazilian population and health systems and services.
104. In that sense, the 2<sup>nd</sup> CNCTIS recommends the following strategies

- to achieve the intended expansion:
- a) Qualify, train and absorb S&T professionals, taking into consideration regional necessities and the integration with development institutions (CNPq, Capes, Finep, FAPs);
  - b) Create incentives to scientific and technological research in health at municipal, state and federal level, through the implementation of programs on scholarships and awards, among others, aimed at the programs on scientific initiation, Master's and Doctor's degree courses. The scholarships and awards would allow the development of studies where the results achieved can be employed in the local health system;
  - c) Develop *lato sensu* and *stricto sensu* post-graduation courses to enhance and strengthen the national and local policies on ST&I/H and management of science, technology and innovation in health, implementing scholarship programs;
  - d) Create Professional Master's courses to technicians in SUS health services network, in order to improve their qualification and enable them to develop researches to improve their professional practice and services quality;
  - e) Promote permanent education in research to use the scientific and technological production to improve health programs and actions. The contents related to research baselines, information systems and use of technologies available should be prioritized, notably in communities with less access to public programs;
  - f) Foster the inclusion in post-graduation programs of subjects concerning intellectual property, definition of strategic areas and projects analysis within the context of health necessities;
  - g) Define policy to the qualification and required incentive to maintain the researchers in public institutions;
  - h) Include module on ST&I/H in capacity-building courses oriented to councilors.
105. To implement the processes of permanent education in research, the recommendations are:
- a) Expand the Ministry of Health's investment in actions and strategies for that purpose;
  - b) Use the distance education methodology;
  - c) Foster the integration between university and service;
  - d) Integrate with qualification policies set forth for the poles of permanent education to SUS;
  - e) Awareness-building among managers towards developing permanent education programs;
  - f) Rule the participation of private education institutions in programs of human resources qualification to SUS;
  - g) Establish upgrading courses for science professors on issues related



to science and technology in health.

106. Create a plan of career, posts and salaries for scientific researchers and health workers of support to scientific and technological research, correcting eventual distortions of functional placement in the science and technology career.
107. Hold public contests to expand the staff in the field of ST&I/H.

## 6 Management Model of the National Policy on Science, Technology and Innovation in Health

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108. The State participation in the PUNCTIS development is crucial to identify the needs and generate recourses that are indispensable to maintain that activity, so crucial to preserve public interest.
109. The State action should be outstanding in what concerns the regulation of production flows and incorporation of technologies, as a foster to the innovation process, guiding and financing R&D activities, pursuant to the National Agenda of Priority Researches in Health and the epidemiological indicators for each region. The proposed actions for that policy, where the State plays a core role, comprise among others:
  - a) Maintenance and expansion of R&D-oriented infrastructure;
  - b) Decentralization of research centers and reference laboratories to the regional poles;
  - c) Incentive to the establishment of cooperative actions in health research for the regional development;
  - d) Training of qualified human resources;
  - e) Fostering lines of research relevant to SUS;
  - f) Dissemination of scientific and technological products;
  - g) Evaluation of technologies and use of the resulting technical knowledge;
  - h) Guarantee of use of intellectual property mechanisms;
  - i) Fostering to the participation of corporations in R&D activities;
  - j) Enforcement of social control on research and development activities;
  - k) Protection to biological, ethnical and cultural diversity.
110. Among the actions in the field of technological policy, where the state participation is crucial, stand out: industrial modernization; dissemination of technical progress and support to innovation. In relation to that last, it is worth mentioning the importance of using the state purchase power as a tool to induce technological development.
111. It is also worth highlighting the importance of enforcing social control at the spheres of health research development, evaluating technological demands and social impacts on local health, aiming at establishing partnerships with education institutions and the decentralization of actions, including the annual analysis of budgets foreseen and executed by health councils and the establishment of theme commissions in S&T in health within the scope of those councils.

112. The financial resources allotted to R&D fostering should be increased. Additionally to those measures to optimize the existing resources, it would be necessary to seek for new sources of revenue and increase the percentage of the Ministry of Health's financial resources allotted to Health Research, according to the recommendation from the Global Forum on Health Research whereby the developing countries were asked to allot 2.0% of health expenditures to R&D in the sector. Furthermore, at least 5% of the Tax over Industrialized Products (IPI) charged on medicines should be addressed to financing the national researches on new pharmaceutical products.
113. To increase efficiency in the use of the Ministry of Health's financial resources, as aforementioned, it would be necessary to canalize to the Secretariat of Science, Technology and Strategic Inputs the National Treasury's resources ensued from the collection of percentages of loans and international agreements addressed to R&D expenditures, and a share of financial resources allotted to ST&I/H actions developed by regulatory agencies bound to the Ministry of Health.
114. The assignment of new resources to ST&I/H cannot imply reductions in the amount committed by the existing development agents, neither the freeze at the levels currently in practice.
115. In what regards new resources, additionally to those from sectoral funds of the Ministry of Science and Technology and those from the budgets at the three governmental levels, it would be necessary to identify new sources like tax collection over economic activities that entail environmental and health damages. For that, part of the revenue earned with fines charged against environmental polluting agents could be used to provide additional resources to such funds. The identification of that source should be inserted in the discussion about health financing, based on the grounds for social security financing. The recommendation, here, is to pose a logic of social interest to the current concept of sectoral funds that, up to now, have been guided by the economic logic. It would also be necessary to take into consideration the potential financial resources ensued from technology transfer to private sector and resources from the Public-Private Partnership (PPP) program for investment in science, technology and innovation in health.
116. Establish as a requirement to install health products or services corporations, the investment in S&T proportional to their market share.
117. Additionally to the new financial resources to afford R&D activities, it would be necessary expanding the resources assigned to infrastructure, notably to the recovery and modernization of the

- research capacity at health units, teaching hospitals and health research institutions. Furthermore, it would be necessary the establishment of centers of support to the development of health studies and researches. In order to ensure efficiency in the resources commitment, it would be necessary to integrate such resources into a single investments plan. The resources should be assigned through strategies of call for bid among projects.
118. To expand investments in teaching hospitals it would be advisable to establish health councils, thus expanding social control and guaranteeing the participation of academic community and the organized civil society. Such universities should be granted the adequate conditions of infrastructure and financing to allow for Health Research development, contemplating regional inequities.
  119. The Research-related Calls for Bid should grant more than six months for scientists to prepare proposals responsive to the expectations of the financing entity.
  120. The PNCTIS management model should comprise a system of technical-scientific information updated and dynamic, preferably using open software, with the installation and adjustment of equipment and software, managerial information that allow for improving the activities on development and evaluation, considering the partnerships among education and research institutions and service providers, health secretariats, municipal health foundations and charity and municipal hospital, like the systems in the Ministry of Science and Technology (for example, the Lattes platform).
  121. Moreover, it should include an adequate system of scientific communications and information, articulated to the existing initiatives, such as the portal of scientific journals of Capes and the Virtual Health Library of Bireme and the Ministry of Health. Moreover, there is the need for mechanisms on social communication, enhancing partnerships between managers and health education institutions to socialize knowledge, thus increasing the SUS actors' participation - users, workers, managers and service providers - aimed at disseminating technical and scientific knowledge, accessible to the society.
  122. To be effective, the proposed managerial model requires the definition of the ST&I/H system as a whole, defining the duties assigned to each federal, state and municipal bodies, health and S&T systems involved in the formulation and implementation of the PNCTIS.





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